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# MEMOIRS

OF THE

## GEOLOGICAL SURVEY

OF

### THE UNITED KINGDOM.

Figures and Descriptions

ILLUSTRATIVE OF

### BRITISH ORGANIC REMAINS.

DECADE I.-VI

PUBLISHED BY ORDER OF THE LORDS COMMISSIONERS OF HER MAJESTY'S TREASURY.

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1849.

## N O T I C E.

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PALÆONTOLOGICAL researches forming so essential a part of geological investigations, such as those now in progress by the Geological Survey of the United Kingdom, the accompanying plates and descriptions of British Fossils have been prepared as part of the Geological Memoirs. They constitute a needful portion of the publications of the Geological Survey, and are taken from specimens in the public collections, or lent to the Survey by those anxious to advance this branch of the public service. Although numerous drawings had previously been made, and engravings from them considerably advanced, it was not thought expedient to commence their publication until the large collections of the Survey could be well examined, which a want of the needful space has, until the present time, considerably retarded. This impediment to progress is now being removed, and when the collections can be properly displayed in the New Museum of Practical Geology, in Jermyn Street, it is hoped that the public will have an opportunity of gradually obtaining, in a convenient manner and at small cost, a work illustrating some of the more important forms of animal and vegetable life there preserved, and which have been entombed during the lapse of geological time in the area occupied by the British islands.

The plan proposed to be followed in the work, of which the two Decades now published form a part, is as follows:—

To figure in elaborate detail, as completely as possible, a selection of fossils, illustrative of the genera and more remarkable species of all

classes of animals and plants the remains of which are contained in British rocks ; to select especially such as require an amount of illustration which, to be carried out by private enterprise, would require a large outlay of money, with little prospect of a return, and a long time to accomplish, but which, by means of the staff and appliances necessarily employed on the Geological Survey, can be effected at small cost, and with a rapidity demanded by the publication of the maps and memoirs of the Survey ; thus, it is hoped, affording an aid to those engaged in the sciences with which this work is connected, that they might not otherwise have possessed, and which may materially promote the progress of individual research.

H. T. DE LA BECHE,  
*Director-General.*

*Geological Survey Office,*  
*24th May, 1849.*

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## BRITISH FOSSILS.

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### DECADE THE FIRST.

THE first Decade of representations of British Fossils is devoted to a selection of Echinoderms, of the Orders *Asteriadae* and *Echinidae*.

With the exception of the *Crinoidea* and *Cystidea*, no special monographs have been devoted to the illustration of our fossil species of Echinodermata, notwithstanding their acknowledged importance in a geological point of view. The majority of species found in British strata are unfigured in British works; a very great number are not figured at all, and those of which we possess British figures are, for the most part, delineated either imperfectly or insufficiently for the demands of science in its present state. This is the more remarkable since, for the description and delineation of numerous species, ample materials exist in collections.

Of the following plates, one is devoted to figures of all the Silurian star-fishes as yet discovered in British strata. None of these have hitherto been represented in any work. Their names only, accompanied by short descriptive characters, have appeared in the "Synopsis of British Fossil Asteriadae," contained in the second part of the second volume of the "Memoirs of the Geological Survey of Great Britain." Some remarkable new forms of star-fishes from the Oolites, and all as yet discovered in the London clay, are figured in the second and third plates.

The fourth plate is devoted to a representation of the only fossil as yet discovered of the family *Euryales*, now for the first time described and figured, through the kind co-operation of the Rev. Professor Sedgwick.

In the six following plates a series of illustrations of the British fossil *Echinidæ* is commenced, of the majority of which, even the commonest and those most important for the identification of strata, no good representations are accessible to the student of English fossils. The importance of a knowledge of the members of this family to the explorers of oolitic and cretaceous strata cannot be too strongly insisted on, and their beauty and interest, in a purely Natural History point of view, render them admirable subjects for elaborate delineations.

When the collections accumulated during the course of the progress of the Geological Survey have been thoroughly examined and arranged, new light may be expected, bearing on the details of structure of the species now figured. Additions will consequently be made to the plates from time to time; and it is proposed to issue supplementary figures of the variations of form exhibited by the several species selected as subjects for these decades.

EDWARD FORBES.

May, 1849.

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# BRITISH FOSSILS.

## DECADE I. PLATE IX.

### NUCLEOLITES CLUNICULARIS.

[Genus NUCLEOLITES. LAMARCK (sub-kingdom Radiata. Class Echinodermata. Order Echinidæ. Family Clypeasteridæ.) Body oval or cordate, more or less tumid, sometimes much depressed; ambulacra dorsally petaloid; anus supra-marginal; mouth sub-central.]

[Sub-genus *Nucleolites*. Anus superior, in a furrow; mouth not surrounded by tubercles.]

SYNONYMS. *Clypeus clunicularis*, PHILLIPS, Geol. York, part 1, p. 115. *Nucleolites clunicularis*, BRONN, Lethæa Geognost., p. 282.

DIAGNOSIS. *N. ambitu suborbiculari, subquadrato, antice rotundato, postice bilobato; dorso convexo, apice subcentrali, vertice apicali, postice declivente; ambulacris anguste lanceolatis; sulco anali profundo, lanceolato, apiculato, ad apicem angustato, lobis posterioribus vix tumidis; ventre concavo.*

VAR.  $\alpha$ . *Major, subdepressa, lata, lateribus tumidiusculis.*—*Spatangus depressus*, LESKE, ap. Klein, p. 238, t. 51, f. 1, 2 (copied in Enc. Meth., pl. 157, f. 5, 6). *Nucleolites scutata*, LAMARCK, An. s. Vert. 3, p. 36. DEFRANCE, Dict. Sc. Nat., vol. xxxv., p. 213. *N. clunicularis*, b. BRONN, Leth., p. 283. *N. scutatus*, AGASSIZ, Echin. Suiss. p. 45, pl. 7, f. 19–21.

VAR.  $\beta$ . *Minor et media, convexa, lateribus tumidiusculis.*—*Nucleolites gracilis*, AGASSIZ, Echin. Suiss. p. 44, pl. 7, f. 10–12?

VAR.  $\gamma$ . *Media, pyramidata, lateribus planiusculis.*—*N. Sowerbii*, DEFRANCE, Dict. Sc. Nat., vol. xxxv., p. 213. *N. pyramidatus*, M'COY, (confirmat. in lit.), Ann. Nat. Hist., 2nd ser., vol. ii., p. 416, Dec. 1848. [Variety figured in our plate.]

The name *clunicularis*, as applied to a fossil sea-urchin, has its origin with Lhwyd, who, in his "Lithophylacii Britannici Ichnographia" (1699), describes "Echinites clunicularis. Echinites e lapide selenite, quinis radiis e duplice serie transversarum lineolarum conflatis," and refers to certain figures in the works of Lister and Plot. The figure in Plot ("History of Oxfordshire," tab. 11, f. 12) represents a body which is possibly *Nucleolites clunicularis* of Phillips, but so badly, that no anal furrow, or anus, is delineated. This figure is referred to by Lister, in his book "De Lapidibus Turbinatis (1678), cap. 11, titulus xxvi.," with a query whether it be identical with his own figure, t. 7, p. 26,

which represents a fossil from Newton Grange, distinctly a Nucleolite, and in all probability var.  $\beta$  of the species we are describing. To this figure the name *Clypeus lobatus* is applied by Dr. Fleming, in his "History of British Animals" (1828), p. 479, while the name *Clypeus clunicularis* is given to the nucleolite figured by William Smith, in his plate of the Coral Rag fossils (Strata Identified, 1817), and characterized in his "Stratigraphical Table of Echini," where it is marked as ranging through upper oolite, "the clay over it," cornbrash, and coral rag. Smith gives no name further than noting it as species No. 2 of *Clypeus*, and, judging from his description, probably meant to include both the *clunicularis* and *dimidiatus* of Phillips, whilst his figure seems to represent the latter.\* Fleming, in making two species (*Clypeus lobatus* and *Clypeus clunicularis*), overlooks the fact that the figure of Lister, on which he founds the former, is the very representation quoted by Llhwyd as representing *Echinites clunicularis*. We next come to John Phillips, who, in his "Geology of Yorkshire," part 1 (1835), figures in his plate of fossils of the Cornbrash, under the name of "*Clypeus clunicularis*, Llhwyd," the nucleolite to which he would preserve the name. Although the figure is far too slight, and no profile is given, there can be no question as to what it is meant for, since, in the first place, the peculiar form of the anal furrow is correctly indicated; and, in the second, a new species of "*Clypeus*," from the coralline oolite, is figured under the name *C. dimidiatus*, representing the only other British form to which the figures of Plot and Lister might be applied. In the text of his "*Lethæa Geognostica*" (1835-37), p. 282, Bronn distinguishes between the *Nucleolites clunicularis* and the *N. scutatus* of Goldfuss (t. 43, p. 6), holding the latter, in which opinion I agree, identical with the *dimidiatus* of Phillips. At the same time he makes the *Spatangus depressus* of Leske's edition of Klein (*Nucleolites scutata* of Lamareck) a variety of *clunicularis*. In the "Catalogue Raisonné des Echinides" of Agassiz and Desor (1847) the second fossil species of *Nucleolites* enumerated is *clunicularis*, Phillips being the authority taken. For the reason, therefore, that the original name, *clunicularis*, as applied by Llhwyd, in all probability included the form before us, whilst the stricter application of it by Phillips is followed by Bronn and Agassiz, the reference of it by

\* Since the above passage was written I have been enabled to examine Smith's original specimens, now lying among undisplayed treasures in the British Museum. They are ten in number; eight preserve the original lettering. "B. 1. a. Bruham," is a sub-depressed specimen of var.  $\beta$  of *clunicularis*; "B. 1. a. Mayhill," is *dimidiatus*; "B. 1. b." locality washed off, is *clunicularis*, var.  $\alpha$ ; "B. 1. c. Wraxhall," is *clunicularis*, var.  $\beta$ ; "B. 1. d.?" label washed off, but probably the Seaford specimen mentioned in the Stratigraphical System, p. 69, is a *dimidiatus*; "B. 1. e.," no label, probably the Trowle specimen, is *clunicularis*, var.  $\gamma$ ; "B. 1. f.," no label, probably the specimen from "South-west of Tellisford," is an intermediate form between  $\alpha$  and  $\beta$  of *clunicularis*; "B. 2." is the same form, and a second specimen marked "B. 2." is a small *clunicularis*,  $\alpha$ .

Fleming to Smith's figure being a mistake, we retain it for the fossil now figured, and the varieties here associated with it.

As, however, the name has been used with different degrees of restriction, it is necessary further to inquire into the grounds of its limitation by different naturalists, and also how far varieties more or less marked have been separated with specific appellations from the normal form. And this leads us to inquire what may be the *Nucleolites scutata* of Lamarck (*Animaux sans Vert.*, 3, p. 36). That author cites, first, the "Echinobrissus" of Breyn.\* Next the *Spatangus depressus* of Leske's edition of Klein (1778), t. 5, f. 1-2, copied in pl. 157, f. 5-6, of the "Encyclopédie Méthodique;" and he quotes a second variety, with a higher back, also from a figure of Breynius. These figures agree, as well as old and nearly worthless representations can agree, with our variety  $\alpha$  *major*; and I assent to the proceeding of Bronn, who considers it a variety of *clunicularis*, of the normal form of which however he curiously enough quotes the figure in Breynius, first referred to by Lamarck as a representation of his *scutatus*. In the second edition of Lamarck, vol. iii. (1840), Dujardin brings in a new set of synonyms, including *Clypeus lobatus*, Fleming, and *Nucleolites clunicularis*, Bronn. They are brought together, as is too frequently the practice among authors who make a great display of synonyms, without regard to their origin, whether original and critical, or blindly copied. The diagnosis originally given by Lamarck is scarcely sufficiently distinct to warrant our using *scutata* as a specific appellation in preference to *clunicularis*; however, he gives no locality for his fossil. The name *Spatangus depressus* of Leske is adopted as *Echinites depressus* by Schlotheim (*Petrefactenkunde*, 1820), and he gives Essex as a locality for his specimen. This was probably a mistake, and as there may be doubts about Leske's species, that name had better also be dropped. In the article *Nucleolites*, "Dict. des Sc. Nat.," vol. xxxv. p. 213 (1825), Blainville quotes the species *Nucleolites scutata* after Lamarck, and also mentions that the locality is unknown. Alongside of it he gives *Nucleolites Sowerbyi*, Defrance, with a few words of description stating that the species is very concave beneath, and that the anus is placed very near the summit. He states that it occurs near Caen, in "la couche a polypiers," and near Sandwich, in England—an evident mistake. This possibly may be intended for our typical *clunicularis*, but to such a description, unaccompanied by a figure, we can give no authority. In F. A. Römer's "Versteinerungen des Nord-Deutschen Oolithen Gebirges" (1836), a Nucleolite is figured (pl. 1, f. 19,) and described under the name of

\* Breyn (*Schediasma de Echinis*, 1732) has two species of his "Echinobrissus," *E. planior*, the figure of which (t. vi. f. 1, 2) appears to be our var.  $\alpha$ ; and *E. elatior*, which is in all probability a bad representation of our var.  $\gamma$ .



*planatus*. This Bronn identifies with *scutata*, Lamarck; but, though evidently nearly allied, the depression is so great, and the anal furrow so peculiarly shaped, that we cannot admit its identity. Bronn has also referred with a query Goldfuss's figure of *Nucleolites cordatus* (pl. 43, f. 9,) to it. That figure would serve as an excellent representation of some of the varieties of *clunicularis*, but as it is a highly magnified representation of a cretaceous fossil, it is probably distinct. The most important works on fossil urchins remain to be cited, viz., those of Agassiz. The first part of this eminent naturalist's work on the fossil Echinodermata of Switzerland (1839) includes a monograph of the Swiss *Nucleolites* (using the term in a very restricted sense), eight in number, five of which are oolitic. Of these the first (*Nucleolites latiporus*) appears to be a variety, more conical than usual, of *N. dimidiatus*, Phillips. I have seen such a form in the collection of Mr. Tennant. The second (*Nucleolites micraulus*) comes exceedingly near the same species. The third (*Nucleolites gracilis*) is to my eye one of our commonest forms of *N. clunicularis*. *Nucleolites scutata*, Lamarck, placed fourth (distinguished from *N. scutatus*, Goldfuss, which is unquestionably *dimidiatus*), is our var.  $\alpha$  in the form when passing into  $\beta$ . The fifth (*Nucleolites major*) is, judging from the figure, a slightly more elongated and large variety of the same. The figures of all these are so very excellent, that I do not hesitate in giving these opinions, especially as the descriptions do not seem to contradict my conclusions. The later work of Agassiz and Desor, "Catalogue Raisonné des Echinides" (1847), is not so satisfactory. The first fossil *Nucleolites* there given is *scutatus*, Lamarck, with reference to the figure in the "Echinodermes Suisses." The second is "*N. clunicularis*," Phillips, the geology of Yorkshire being the first citation; its synonyms are "*Nucleolites Goldfussii*," Desmoulins, and "*Nucleolites Sowerbyi*," Defrance. The latter reference we have already seen to be next to worthless; the former name is stated by M. Agassiz himself to have been given by Desmoulins to the *N. scutatus* of Goldfuss ("Ech. Suisses," pl. 1, p. 45). Yet in this catalogue the name of Goldfuss is quoted as a synonym of *N. micraulus*, Agassiz, (on which I have already remarked; but it appears to be *dimidiatus*, Phillips,) whilst *dimidiatus* is enumerated as a distinct species, identical with *Nucleolites paraplesius* of Agassiz's "Catalogue Systématique." Then comes *N. latiporus*, Agassiz, with the note that it is probably a variety of *clunicularis*; whereas, in the "Echin. Suiss.," p. 43, it is compared with *Goldfussii*, and a new species, *N. Terquemi*, said to be near *clunicularis* also, whilst *gracilis* is retained as distinct. Further on M. Desor has made a new species, "*N. Thurmanni*," for a cornbrash *Nucleolites*, "assez voisin du *N. latiporus*," which we had been already told was itself "peut-être une variété du *N. clunicularis*." We thus

become involved in a labyrinth of names, several of which are unaccompanied by either descriptions or figures, a state of things more likely to retard than to advance our palæontological studies. Lastly, in the "Annals of Natural History," for December, 1848, three new British oolitic *Nucleolites* are described by Mr. M'Coy, under the names *planulatus*, *pyramidalis*, and *æqualis*, all of which I cannot help surmising will prove, on closer examination, but varieties of *clunicularis*. The second, *N. pyramidalis*, from the cornbrash of Weymouth, has been identified by Mr. M'Coy with the figure on our plate, he having kindly replied to that effect to my inquiries on the subject. In his Paper he remarks, "This resembles the *N. clunicularis* (Smith, sp. *Clypeus lobatus*, Flem.) in the long, deep, narrow posterior sulcus, extending quite from the vertex, but is wider and more quadrate, the base having exactly the form of the *N. scutatus*, Lamarck; from the latter it differs in the strong sulcus uniting the pores, as in most of the genus, and from both species it is distinguished by its pointed elevated apex, and the straight declivity of the posterior side." On this passage I would remark that, in the first place, the name *clunicularis* is not given by Smith, whose figure (without a name) probably represents *dimidiatus*; that *Clypeus lobatus*, Fleming, was a name given by that author to a species he considered distinct from his *clunicularis*, "Smith," as I have already shown; that "a strong sulcus" unites the pores quite as much in the var. *scutatus* as in var. *pyramidalis*; and that the degree of elevation of the apex and declivity of the posterior side varies not only in every variety, but in almost every specimen, among the many I have examined,\* of all the varieties of this variable species.

*Description*.—Outline suborbicular, with a tendency to quadrate, broadening out slightly, and more or less bilobed posteriorly, rounded anteriorly. Back more or less elevated, varying from subdepressed (var.  $\alpha$ ) to subconical (var.  $\gamma$ ), but exhibiting all intermediate degrees of convexity. The true apex is invariably the highest point, from which the sides decline with greater or less steepness, and anteriorly with more or less straightness. The apex is always excentric, inclining towards the anterior extremity. The portion of the back in front of the apex is about one-sixth shorter than that behind it. The anal furrow reaches quite to the apex, in some specimens slightly indenting it. It is always of a lanceolate-acuminate form; lanceolate to the upper part, the anus then narrowing into a prolonged and shallower, but still strongly marked groove. The anus is very deep sided, and the bounding walls of the groove diverge slightly downwards. The lower part of the groove, behind the anus, is very much depressed and well defined. The ambulacra are petaloid with subparallel sides, the spaces between the rows

\* Through the kind co-operation of Mr. Woodward, the *Nucleolites* of the British Museum were laid out for my inspection.

of pores forming each ambulacrum varying slightly in width in different specimens; those of the two posterior ambulacra widest. The upper part of the latter run close in contact and partly over the edge of the superior or narrow portion of the anal groove. The furrow uniting the pairs of pores varies in depth in different examples. The number of conspicuous pores in each row dorsally is from 36 to 40. The spaces separating the grooves linking the pairs of pores are minutely granulated. The whole surface of the dorsal, lateral, and inferior ambulacral and interambulacral plates is covered with thickly-set minute spiniferous tubercles, lodged in moniliform depressions, the interspaces minutely granulated. The ovarian plates are well covered with similar granules, no tubercles. The ovarian pores are conspicuous, except the posterior one, which is obsolete. Very distinct holes for the ocelli are seen at the summits of the ambulacral avenues. The ventral surface is more or less concave, most so in the pyramidal varieties. The ambulacra radiate in depressed furrows from the mouth, becoming shallower towards the margin. The mouth is more eccentric, and nearer to the anterior margin than the apex. The tubercles on the ventral surface are rather more scattered than on the dorsal.

*Comparative Dimensions of average Specimens of each of the three varieties (all of which, however, insensibly pass into each other), in inches and twelfths.*

	$\alpha$	$\beta$	$\gamma$
Length . . . . .	$1 \frac{4}{12}$	$0 \frac{11}{12}$	$1 \frac{1}{12}$
Breadth . . . . .	$1 \frac{2}{12}$	$0 \frac{11}{12}$	$1 \frac{4}{12}$
Height . . . . .	$0 \frac{8}{12}$	$0 \frac{6}{12}$	$0 \frac{8}{12}$
Apex to anterior margin . . . . .	$0 \frac{8}{12}$	$0 \frac{6}{12}$	$0 \frac{7}{12}$
Mouth to anterior margin . . . . .	$0 \frac{5}{12}$	$0 \frac{4}{12}$	$0 \frac{5}{12}$
Length of anal furrow . . . . .	$0 \frac{8}{12}$	$0 \frac{7}{12}$	$0 \frac{9}{12}$
Breadth of anal furrow at anus . . . . .	$0 \frac{2\frac{1}{2}}{12}$	$0 \frac{2}{12}$	$0 \frac{2}{12}$

*British Localities and Geological Range.*—INFERIOR OOLITE, Stroud (B. M.). GREAT OOLITE, Minchinhampton (B.M.). Cirencester (S. P. Woodward). CORNBRAsh, Yorkshire (Phillips). Abundant in cornbrash of Dorset (Bristow, Gapper). Chippenham, small gray variety (S. P. Woodward). Northampton (B. M.).

*Foreign Distribution.*—(Extracted from the catalogue of Agassiz and Desor.) “Oxford. d’Alencon, Courgains (Sarthe), Calc. a Polypiers de Ranville, Coulie.—var. minor. Forest Marble de Chatelcensoir.” Form *latiporus*, “Cornbrash de Metingen, Maiche.” Form *gracilis*, “Ool. Ferrug. de Durrenast (Jura Soleurois).”



## DESCRIPTION OF THE PLATE.

Fig. 1, var.  $\gamma$ , dorsal view. Fig. 2, ventral surface. Fig. 3, profile. Fig. 4, diagram of the dorsal structure. Fig. 5, apical disk of ovarian and ocular plates. Fig. 6, portion of surface of a plate magnified. Fig. 7, arrangement of the pores in the ambulacral avenues.

NOTE on British *Nucleolites* allied to *N. clunicularis*.

Under the generic appellation *Nucleolites* I include all the members of the family *Cassidulidæ* (Agassiz) with petaloid ambulacra and a supra-marginal anus, and under the subgenus *Nucleolites* those members of the genus so called, in which the anus is placed high up within a deep sulcus. To the orbicular species of this division the generic term *Clypeus* (Klein) is restricted in the arrangement of Agassiz, who styles those only *Nucleolites* in which the shape is more or less angularly subquadrate. He further distinguishes between the two sections by the presence of tubercles or prominences around the mouth in the former, and their absence in the latter, a distinction which does not hold good, since in *Nucleolites lacunosus* the oral prominences are more strongly marked than in *Clypeus Hugii*. There is, moreover, a gradual progression of form from the almost completely orbicular outline of *Clypeus sinuatus* to the ovate contour of *Nucleolites lacunosus*.

Though the name *Clypeus* was used by Klein before that of *Nucleolites*, the latter is preferred because proposed as a definite generic appellation by Lamarck.

Our British *Nucleolites* are all either oolitic or cretaceous. In the species of the older secondary rocks we find a structure of the ambulacral pores which distinguishes them easily on close examination, however nearly they may resemble at first glance, from those of the upper secondaries. The former have the external series of pairs of pores in each ambulacrum more or less widened and marked by conspicuous connecting furrows; the latter have the pairs of pores in the outer series closely set together, and the furrows consequently indistinct. The widening of the avenues by poriferous sulci is most conspicuously exhibited in *Nucleolites sinuatus*, and in this species and its allies the pores of the ambulacra near the mouth have a tendency to fall into ranks of several pairs.

The British *Nucleolites* known to me are the following:—

## A. SPECIES OF THE OOLITIC TYPE.

1. *Nucleolites clunicularis* (including *scutatus* or *depressus*, and *pyramidatus*), as defined in the preceding account of the species.

2. *Nucleolites dimidiatus* (Sp.), Phillips, Geol. of Yorkshire, vol. i., pl. 3, f. 16. Coral-line Oolite.

*N. ambitu ovato, antice rotundato, postice bilobato; dorso convexo, apice centrali, vertice subcentrali, postice tumido; ambulacris anguste lanceolatis; sulco anali profundo, ovato, obtuso, superne abbreviato, lobis posterioribus tumidis; ventre plus minusve concavo.*

This species rarely exceeds an inch in length, and varies greatly in the convexity of its upper surface. The ovate anal sulcus, reaching about two-thirds of the distance between the posterior margin and the true summit, conspicuously distinguishes it from *clunicularis*, with which it was confounded before being distinguished by Phillips.

It occurs in both coral rag and cornbrash, but especially in the former.

3. *Nucleolites orbicularis* (Sp.), Phillips, Geol. of Yorkshire, vol. i., pl. 7, fig. 3.

*N. ambitu orbiculari, lateribus tumidis, dorso convexo, apice vertice-que centrali, ambulacris lanceolatis, ad apicem distantibus; sulco anali oblongo, obtuso, ad verticem approximato, lobis posterioribus obsoletis; ventre concavo, ore subcentrali.*

Usual diameter about an inch and a quarter. Cornbrash of Wilts and Yorkshire. Coral rag of Calne. The ocular plates are more apart, and the vertex consequently broader in this than in any other British *Nucleolite*.

4. *Nucleolites Hugii*, Agassiz, Echin. Suiss. vol. i., p. 35, t. 5. figs. 1-3.



*N. ambitu suborbiculari, subsinuato, lateribus decliventibus; dorso convexo apice sub-excentrali, supra-anali, vertice excentrico; ambulacris lanceolatis, ad apices approximatis; sulco anali oblongo, obtuso, lato, brevi, ab vertice distante; lobis posterioribus obsoletis; ventre concavo, ore valde excentrico.*

About the size of the last. Inferior oolite of Stroud (Mr. J. G. Lowe), communicated by Mr. Woodward.

5. *Nucleolites sinuatus* (Sp.), Leske. Parkinson, Org. Rem., vol. iii., pl. 2, fig. 1. 2.

*Galerites patella*, Lamarek (? of Agassiz, Echin. Suisses).

*N. ambitu orbiculari, lateribus decliventibus; dorso subdepresso, apice vertice-que vix centrali; ambulacris late lanceolatis, ad apices approximatis; sulco anali lanceolato acuminato, in verticem prolongato, profundo, lateribus abruptis; lobis posterioribus nullis; ventre concavo.*

Two inches and a half, or more, in diameter. Cornbrash, great oolite, inferior oolite, and coralline oolite in many places.

In the "Catalogue Raisonné des Echinides," of Agassiz and Desor, there is a *Clypeus rimosus*, "Espèce plate, discoïde à ambulacres costulés," evidently nearly allied to this species, and said to be from oolitic strata in Gloucestershire; it is in the collection of M. Deluc.

6. *Nucleolites emarginatus* (Sp.), Phillips, Geol. of Yorkshire, vol. i., t. 3. f. 18.

*N. ambitu orbiculari, lateribus decliventibus; dorso subdepresso, apice vertice-que vix centrali; ambulacris late lanceolatis, ad apices approximatis, sulco anali brevissimo, obtuso, ab vertice valde distante; lobis posterioribus obsoletis.*

As large as the last species. In the coralline oolite of Yorkshire.

Besides the above-named species, there is a small Nucleolite from the great oolite of Harleston, apparently distinct, allied to *clunicularis*. In the British Museum.

In the same collection there is also a small species from the inferior oolite of Stroud, which is probably new. See also Mr. McCoy's paper in Ann. N. H. 3rd ser. vol. ii., p. 417.

#### B. SPECIES OF THE CRETACEOUS TYPE.

7. *Nucleolites cordatus*, Goldfuss, Pet. Germ., pl. 43, fig. 9.

*N. ambitu ovato-rotundo, antice rotundato postice vix bilobato; dorso convexo, apice vertice-que centrali; ambulacris anguste lanceolatis; sulco anali profundo, late-lanceolato, superne subacuminato, lobis posterioribus tumidiusculis.*

Upper green sand of Wiltshire. In Mr. Tennant's collection. The specimen agrees in form, tumidity, and size, with that figured by Goldfuss. It is not so distinctly lobed posteriorly, and the anal furrow is not so narrow or acuminate.

8. *Nucleolites lacunosus*, Goldfuss, Pet. Germ., t. 43, fig. 8.

*N. ambitu ovato, antice obtuso, postice subquadrato, subtruncato, lateribus subcompressis; dorso convexo, apice subcentrali seu supra-anali, vertice excentrico; ambulacris lanceolatis, lateribus subrectis; sulco anali profundo, brevi, oblongo, abrupte declivente, lobis posterioribus subdepressis; ventre excavato.*

Specimens are usually about half an inch in length. Common in the upper green sand of Warminster (Survey Collections).

9. *Nucleolites Morrisii*, Forbes; *Cassidulus lapis cancri*, Morris, Cat. p. 49 (not of Goldfuss).

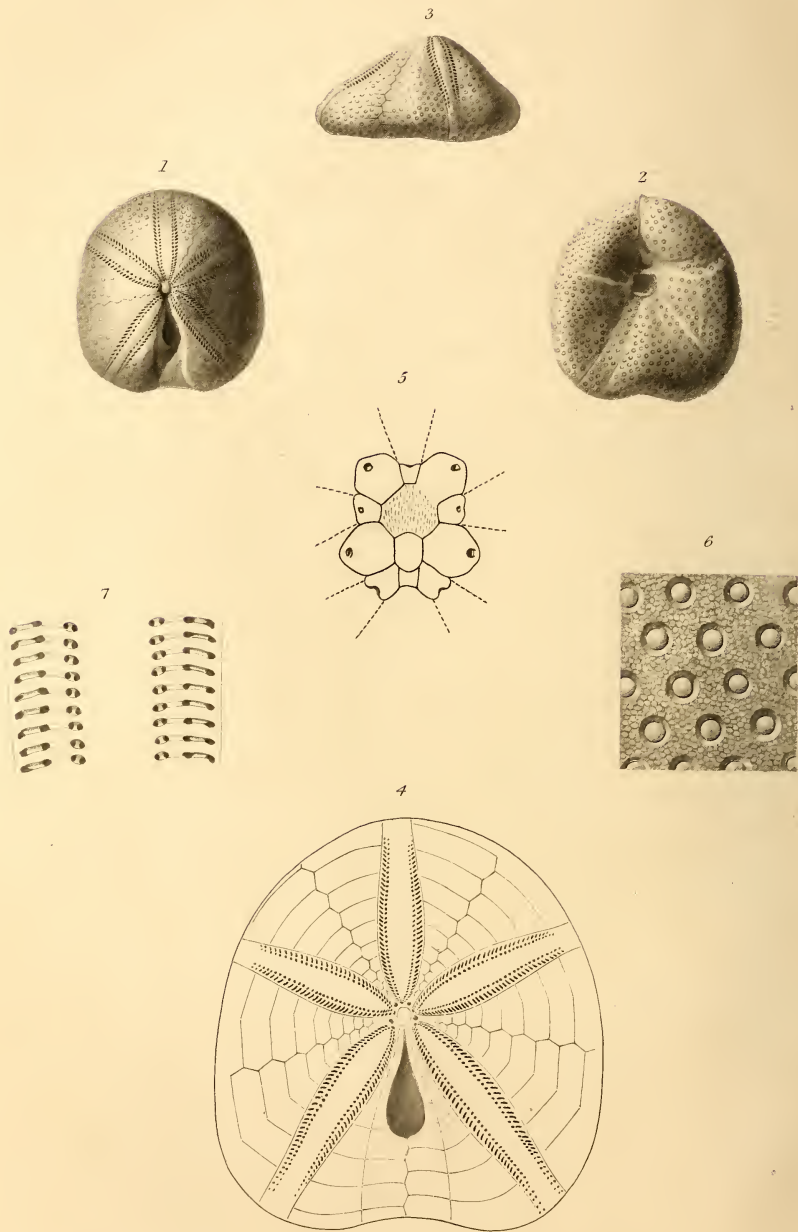
*N. ambitu oblongo, antice postice-que obtuso, lateribus depressis, dorso depresso, apice subcentrali, vertice centrali; ambulacris linearibus; sulco anali profundo, brevissimo, subtriangulari; lobis posterioribus nullis; ventre excavato.*

Large specimens are half an inch in length. Upper green sand of Warminster and Blackdown (Mus. Tennant).

E. FORBES.

April, 1849.

## Geological Survey of the United Kingdom.

NUCLEOLITES  
(Oolitic.)NUCLEOLITES CLUNICULARIS — *Phillips*.